
HATCHERY EVALUATION REPORT

Clearwater Hatchery - Spring Chinook

September 1996

Integrated Hatchery Operations Team (IHOT)

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**An Independent Audit Based on Integrated Hatchery Operations Team
(IHOT) Performance Measures**

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Executive Summary

This report presents the findings of the independent audit of the Clearwater Hatchery - Spring Chinook program. The hatchery is located on the north bank of the North Fork of the Clearwater River, downstream from the Dworshak Dam in Idaho. The hatchery is used for incubation and rearing of spring chinook and summer steelhead.

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)*. That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Clearwater Hatchery - Spring Chinook Results

The Clearwater Rapid River facility includes two ponds for adult holding, 35 concrete raceways, incubation facilities, and three satellite facilities for adult collection, spawning, and acclimation. The Clearwater Hatchery was constructed in 1992 as part of the Lower Snake River Compensation Plan (LSRCP) to compensate for anadromous fishery losses caused by the four federal dams constructed on the lower Snake River.

The Clearwater Hatchery was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal. The audit found that the hatchery was not in compliance with the alkalinity and hardness criteria, incubation facilities, alarm monitoring equipment, water quality monitoring, and pathology-free water criteria, which are all facilities requirements. The hatchery needs one more raceway to make up for the raceway used by the captive brood program. In the compliance area for fish health policy, the hatchery did not meet the criteria of routine hatchery visits every month. The hatchery did not have a final Genetics Monitoring and Evaluation Program in place and needed the plan reviewed by a qualified geneticist.

The specific areas in which the Clearwater Hatchery - Spring Chinook program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Build 10 more incubator stacks
- Determine if adult contribution data is available
- Develop disease-free water supply
- Develop smoltification goals and monitoring program
- Double screen chinook raceways
- Finalize genetics monitoring and evaluation plan
- Follow IHOT QA/QC feed tests
- Follow IHOT standards for checking “other” alarms
- Have qualified geneticist review the plan
- Improve eyed-egg to fry survival
- Improve green-egg to eyed-egg survival
- Increase “monthly” fish health monitoring visits to once a month
- Increase alkalinity and hardness
- Reduce weather related stress on fish at acclimation sites
- Run analysis for contaminants
- Run analysis for nitrite
- Run analysis for water chemistry parameters
- Set up and program alarm system

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

Facility Description

Name:	Clearwater Hatchery
Stock/Species:	Spring Chinook Summer Steelhead Rainbow Trout
Operating Agency:	Idaho Department of Fish and Game
Funding Agency:	LSRCP
Location:	Located on the north bank of the North Fork of the Clearwater River, downstream from the Dworshak Dam. It 504 miles from the mouth of the Columbia River and the site elevation is 994 feet above sea level.
Address:	Idaho Department of Fish and Game Clearwater Hatchery 4156 Ahsaka Road Ahsaka, ID 83520
Hatchery Manager:	Mr. Jerry McGehee
Phone:	(208) 476-3331
Fax:	
Purpose:	<p>The Clearwater Hatchery was constructed in 1992 as part of the Lower Snake River Compensation Plan to compensate for anadromous fishery losses caused by the four federal dams constructed on the lower Snake River.</p> <p>The LSRCP mitigation goals are to return 11,915 adult spring chinook and 14,000 adult steelhead about Lower Granite, for the Clearwater River.</p>
Production Goal:	<p>Summer Steelhead</p> <p>2.3 million smolts (350,000 lb) for release in the Clearwater drainage</p> <p>Spring Chinook</p> <p>300,000 smolts (15,000 lb) for final rearing and release at the Red River satellite facility</p> <p>800,000 smolts (40,000 lb) for final rearing and release at the Crooked River satellite facility</p> <p>300,000 smolts (15,000 lb) for final rearing and release at the Powell satellite facility</p>

Rainbow Trout (catchables)

Variable, depends on egg sources

Total salmon production: 420,000 lb

Water Supply:

Two pipelines from the Dworshak Reservoir (80 cfs total capacity)

Facilities:

Adult Holding:	2 adult holding ponds at hatchery
Incubation:	40 stacks of vertical tray incubators (16 trays) 60 incubation jars
Early Rearing:	60 early rearing tanks - 480 cf each
Raceways:	11 raceways for chinook - 8,000 cf each 24 raceways for steelhead - 12,000 cf each
Rearing Ponds:	none
Satellite Facilities:	Red River (adult trapping, spawning, and acclimation) Crooked River (adult trapping, spawning, and acclimation) Powell (adult trapping, spawning, and acclimation)

Section 3

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (referred to as *IHOT 1995* in this report).¹ The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit. This process consisted of research and onsite visits. The site visit at the Clearwater Hatchery was conducted on September 20, 1996.

¹Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

The following is the five-step audit process:

1. Information was obtained from headquarters.
2. The hatchery manager was asked to fill out and return the **Audit Form**.
3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.
4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.
5. This information was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Clearwater Hatchery - Spring Chinook

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✓) indicates that the specific life stage is held at this facility.

This section documents the compliance status of the Clearwater Hatchery - Spring Chinook program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

Table 1 Summary Program Information for Clearwater Hatchery - Spring Chinook

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Red River Satellite	Powell Satellite	Crooked River	Clearwater Hatchery		
Adult Collection	✓	✓	✓			
Adult Holding	✓	✓	Moved to Red River Satellite			
Spawning	✓	✓				
Fertilization	✓	✓				
Incubation				✓		
green-to-eyed				✓		
eyed-to-hatch				✓		
Rearing				✓		
fry				✓		
fingerlings				✓		
smolts				✓		
Acclimation/release	✓	✓	✓			

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin management plan?		✓			Columbia Basin System Planning Production Plan, LSRCP, and Idaho 5-year Anadromous Plan	
ie hatchery operating under a current hatchery operational plan?		✓			IHOT Operations Plan and Clearwater Operations Manual	
s it understood by staff?		✓				
s it being followed?		✓				
hatchery monitoring and evaluation plan in place?					Anadromous Fish Hatchery Evaluation Plan	
o you have a written monitoring and evaluation plan?		✓				
ilt contribution to fisheries, spawning grounds, and chery			✓		No data provided to team; some return data available to release sites	Determine if adult contribution data available
ilt pre-spawning survival as compared with blished goal		✓			Review of records; in compliance 5 out of last 5 years	
-take as compared with established hatchery goal				✓	Review of records; in compliance 1 out of last 5 years	Improve adult returns
een-egg to eyed-egg survival as compared with blished goal				✓	Review of records; in compliance 3 out of last 4 years	Improve green-egg to eyed egg survival
d-egg to fry survival as compared with established l				✓	Review of records; in compliance 3 out of last 4 years	Improve eyed-egg to fry survival
to smolt survival as compared with established goal		✓			Review of records; in compliance 4 out of last 4 years	
duction as compared with established goal				✓	Review of records; in compliance 1 out of last 5 years	Improve adult returns
cent survival (smolt to adult) as compared with blished goal				✓	Review of records; in compliance 1 out of 8 years (Red River)	Improve adult returns
nber of eggs, fry, fingerlings, smolts, and/or adults meet basinwide needs	✓				Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Temperature						
Does your water temperature meet the criteria for spawning?				✓	Not in compliance at the satellites	Develop groundwater supplies for satellites
Does your water temperature meet the criteria for incubation?		✓			Review of records/Discussion	
Does your water temperature meet the criteria for rearing?				✓	Not in compliance at the Red River and Crooked River satellites	Develop groundwater supplies for satellites
Dissolved gases						
Is the oxygen level near saturation?		✓			Review of records/Discussion	
Is the dissolved nitrogen level less than saturation?		✓			Review of records/Discussion	
Chemistry						
Ammonia (un-ionized)		✓	✓ ✓		Review of records/Discussion	Run analysis for carbon dioxide Run analysis for chlorine
Carbon Dioxide					No data provided to team	
Chlorine					No data provided to team	
H		✓			Review of records/Discussion	
Copper		✓			Review of records/Discussion	
Hydrogen Sulfide		✓			Review of records/Discussion	
Iron		✓			Review of records/Discussion	
Manganese		✓			Review of records/Discussion	
Turbidity						
Does your turbidity meet the criteria?				✓	Exceeds criteria at Powell and Red River satellites	Reduce turbidity at satellites

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Alkalinity and hardness						
Does your alkalinity and hardness meet the criteria?				✓	Review of records/Discussion	Increase alkalinity and hardness
Nitrite						
Does your nitrite meet the criteria?			✓		No data provided to team	Run analysis for nitrite
Contaminants						
Aldrin			✓		No data provided to team	Run analysis for contaminants
Dieldrin			✓		No data provided to team	Run analysis for contaminants
Endrin			✓		No data provided to team	Run analysis for contaminants
Heptachlor			✓		No data provided to team	Run analysis for contaminants
Chlordane			✓		No data provided to team	Run analysis for contaminants
Permethrin			✓		No data provided to team	Run analysis for contaminants
Phenothiazine			✓		No data provided to team	Run analysis for contaminants
Malathion			✓		No data provided to team	Run analysis for contaminants
Parathion			✓		No data provided to team	Run analysis for contaminants
Diseases						
What portions of the hatchery have disease-free water?						
Adult holding				✓	Inspection of facilities/ Discussion	Provide disease-free water supply
Incubation				✓	Inspection of facilities/ Discussion	
Early rearing				✓	Inspection of facilities/ Discussion	
Rearing				✓	Inspection of facilities/ Discussion	
Others				✓	Inspection of facilities/ Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Alarm Systems						
Do the following areas have alarms?					Alarm system is not completely functional	Set up and program alarm system
Intake		✓			Inspection of facilities/ Discussion	
Large rearing ponds and adult holding ponds		✓			Inspection of facilities/ Discussion	
Raceway headboxes and rearing ponds		✓			Inspection of facilities/ Discussion	
Incubation facilities		✓			Inspection of facilities/ Discussion	
Quarantine areas and facilities				✓	Inspection of facilities/ Discussion	Install alarms in quarantine area
Water treatment systems	✓				Inspection of facilities/ Discussion	
Security				✓	Inspection of facilities/ Discussion	Install security alarms
Are there outside systems and buzzers in on-site residences?		✓			Discussion	
Are water flow alarms checked daily?		✓			Review of records/Discussion	
Are all other alarms checked weekly?				✓	Discussion	Follow IHOT criteria for checking alarms
Is there a log of alarms for emergencies, tests, and maintenance requirements?		✓			Review of records/Discussion	
Are telephone pagers used?				✓	Discussion	May not be a problem
Adult collection and holding facilities						
Do you meet the adult holding criteria?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Stacking facilities						
Type 1: Vertical Stack Do you have an adequate number of units for the overall program?				✓	Inspection of facilities/Discussion	Install 10 more stacks
Type 2: Jars Do you have an adequate number of units for the overall program?		✓			Inspection of facilities/Discussion	
Rearing facilities						
Type 1: Early Rearing Vats Do you have an adequate number of units for the overall program?		✓			Inspection of facilities/Discussion	
Type 2: Chinook raceways Do you have an adequate number of units for the overall program?		✓			Inspection of facilities/Discussion	
Type 3: Acclimation ponds Do you have an adequate number of units for the overall program?		✓			Inspection of facilities/Discussion	
Screening facilities						
Do you meet the approach velocity criteria?		✓			Inspection of facilities/Discussion	
Are the fish screens regularly cleaned?		✓			Inspection of facilities/Discussion	
Does the screen mesh meet screen opening criteria?		✓			Inspection of facilities/Discussion	
Are rearing containers double screened for fish that should not be released to adjacent water?				✓	Inspection of facilities/Discussion	Double screen chinook raceways
Predator control facilities						
Are your predation control facilities effective?		✓			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
d storage facilities and quality control						
Does the storage of dry/semi-moist/moist foods (dry<12%; semi-moist 12-20%; moist >20% moisture) follow food manufacturer's recommendations?		✓			Inspection of facilities/Discussion	
Does a regional quality control officer oversee production procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?				✓	Discussion	Perform IHOT QA/QC for feed
Ensure feed does not contain unwanted drugs or other additives?				✓	Discussion	Perform IHOT QA/QC for feed
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✓	Discussion	Perform IHOT QA/QC for feed
Are the foods stored and handled according to the following criteria?						
Moist pellets should not exceed 10 °F at point of delivery.		✓			Discussion	
Moist pellets should be removed from freezer just prior to feeding.		✓			Discussion	
Do not leave buckets of feed or feed containers outside exposed to light or heat.		✓			Discussion	
Open bags of feed should be fed within one to two days except when feeding small groups of fish.		✓			Discussion	
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Release facilities						
Do the release facilities ensure that fish are not subjected to adverse conditions?				✓	Adverse weather conditions can stress fish at acclimation sites	Reduce weather related stress on fish at acclimation sites
Pollution abatement facilities						
Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)?		✓			Inspection of facilities/Discussion	
Are pollution abatement facilities operated correctly?		✓			Discussion	
Transportation facilities						
Are the transport systems adequate to meet IHOT performance measures for transportation practices?		✓			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Broodstock selection practices						
Is the donor selection process document attached?	✓				Existing program; does not apply	
Was the donor selection outline followed in selecting the hatchery broodstock?	✓				Existing program; does not apply	
to PM #40 in Genetics Section						
Spawning practices						
Were the appropriate number of spawners, male/female ratios, and fertilization protocols used?				✓	Review of records/Discussion	Improve adult returns
to PM #42 in Genetics Section						
Incubation practices						
Are specific incubation standards listed in the hatchery operations plan?		✓			Reviewed IHOT Operations Plan and Clearwater Operations Manual	
Are incubation practices written?		✓			Review of records/Discussion	
Incubation Type 1: <u>Vertical stack</u> (see PM #8) you meet the loading and flow criteria?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Rearing practices						
Do you have specific rearing standards listed in the hatchery operations plan?		✓			Review IHOT Hatchery Operations Plan and Clearwater Operations Manual	
Are rearing practices written?		✓			Clearwater Operations Manual	
Rearing Unit Type 1: Early Rearing (see PM #9)						
Do you meet the density and DI criteria?		✓			Review of records/Discussion	
Do you meet the Loading and FI criteria?		✓			Review of records/Discussion	
Rearing Unit Type 2: Final Rearing (see PM #9)						
Do you meet the density and DI criteria?		✓			Review of records/Discussion	
Do you meet the Loading and FI criteria?		✓			Review of records/Discussion	
Rearing Unit Type 3: Acclimation (see PM #9)						
Do you meet the density and DI criteria?		✓			Review of records/Discussion	
Do you meet the Loading and FI criteria?		✓			Review of records/Discussion	
Smolt quality						
Do you produce a high quality smolt?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Health management practices						
Are the monthly hatchery monitoring visits being conducted? (PM #26)				✓	Being visited about every 6 weeks	Increase monitoring visits to one every month
Are the annual broodstock inspections being conducted? (PM #27)		✓			Review of records/Discussion	
Is there pathogen-free water and are the sanitation procedures being followed? (PM #28)				✓	Review of records/Discussion	Develop source of disease-free water supply
Are the following water quality parameters within criteria? (PM #5a-5h)						
Water temperature				✓	Review of records/Discussion	Develop groundwater supply for satellites
Dissolved gases		✓			Review of records/Discussion	
Chemistry			✓		Review of records/Discussion	Run analysis for chemistry parameters
Turbidity				✓	Review of records/Discussion	Reduce turbidity at satellites
Alkalinity and hardness				✓	Review of records/Discussion	Increase alkalinity and hardness
Nitrite				✓	Review of records/Discussion	Run analysis for contaminants
Contaminants				✓	Review of records/Discussion	
Are rearing standards being followed? (PM #19)		✓			Review of records/Discussion	
Are egg and fish transfer/release requirements met? (PM #31)		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Do hatchery performance meet requirements defined in the regional hatchery policies and in basin and hatchery plans for the following areas?</p> <p>Percent smoltification</p> <p>Do you measure percent smoltification?</p> <p>Did you meet the smoltification criteria?</p>				<p>✓</p>	<p>Discussion</p> <p>Discussion</p>	<p>Develop smoltification goal and monitoring program</p>
<p>Rearing density (prior to release)</p> <p>Did you meet the rearing density criteria just prior to release?</p>		✓			<p>Review of records/Discussion</p>	
<p>Disease condition (at release)</p> <p>Did you meet all disease regulations just prior to release?</p>		✓			<p>Review of records/Discussion</p>	
<p>Release number (at release)</p> <p>Did you meet the release number goal?</p>				✓	<p>Review of records/Discussion</p>	<p>Improve adult returns</p>
<p>Release size (at release)</p> <p>Did you meet the size goal?</p>		✓			<p>Review of records/Discussion</p>	
<p>Release date (at release)</p> <p>Did you meet the release date goal?</p>		✓			<p>Review of records/Discussion</p>	
<p>Release location (at release)</p> <p>Did you release the fish at the specified location?</p>		✓			<p>Review of records/Discussion</p>	
<p>Subbasin acclimation (at release)</p> <p>Are the fish reared in the subbasin?</p> <p>Are the fish acclimated in the subbasin?</p>		<p>✓</p> <p>✓</p>			<p>Discussion</p> <p>Discussion</p>	
<p>Release strategy appropriate for the program?</p>		✓			<p>Discussion</p>	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Transportation facilities						
Do transportation equipment and personnel receive disinfection before and after use?		✓			Discussion	Follow IHOT disinfection protocols for transport vehicle cab
Is the fish tank interior disinfected using a solution of 100 ppm active chlorine for 30 minutes minimum or formaldehyde gas generation method (relative humidity of 60% for 2 hrs)?		✓			Discussion	
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?		✓			Discussion	
Is the fish transport vehicle (cab) disinfected using 600 ppm quaternary ammonia compounds (1.5 ml of 50% stock solution/liter water)?				✓	Discussion	
Is other equipment disinfected including fish pumps, nets, egg sorters, waders, boots, rain gear, hoses and other equipment using one of the following solutions? 200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✓			Discussion	
Do personnel wear protective garments when handling fish eggs or cultural water?		✓			Discussion	
Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?		✓			Discussion	
Is a daily service inspection completed before starting pump and leaving for the day?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Transportation facilities						
Does the fish transport unit receive an inspection prior to loading?		✓			Discussion	
Does a pre-loading inspection covering: tank water level, pumps or aerators, oxygen injection system settings, displacement gauge, and truck loading/hauling density tables checked and reviewed occur prior to loading fish in the transport unit?		✓			Discussion	
Do hauling criteria include checking the fish 45 minutes to 1 hour after loading ?		✓			Discussion	
When fish are active and systems are functioning properly, is the oxygen concentration reduced and maintained at approximately 8 ppm?		✓			Discussion	
Is water temperature in the transportation unit maintained within the 42-48 °F range?		✓			Discussion	
Do fish releasing procedures include the following criteria?						
Releasing the fish at the correct release site or into the correct water body.		✓			Discussion	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.		✓			Discussion	
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Evaluation practices						
Has the hatchery conducted fishery contribution studies?						
Determine the requirements for evaluating and improving management programs?		✓			Discussion	
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?		✓			Discussion	
Develop guidelines that define if the proper stocks of fish are currently being used?		✓			Discussion	
Determine which management units contribute to a specific fishery and the time periods of those contributions?		✓			Discussion	
Determine the relative contributions of the various management units to a specific fishery over the different time periods?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ining practices						
Does the hatchery have a training schedule for its staff?		✓			Review of records/Discussion	
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✓			Review of records/Discussion	
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✓			Review of records/Discussion	
Does the hatchery encourage and reward off-duty training of staff?		✓			Review of records/Discussion	
Does the hatchery conduct monthly staff meetings?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>monthly hatchery monitoring visits being conducted by a qualified fish health specialist as described below?</p> <p>Conduct visit at least monthly</p> <p>Monitoring conducted by qualified fish health specialist</p> <p>Examine a representative sample of healthy and moribund fish from each lot.</p> <p>Review fish culture practices with hatchery manager.</p> <p>Report finding and results of necropsies on standard form.</p> <p>Recommend appropriate drug or chemical treatment.</p> <p>Summarize fish health status or stock prior to release or transfer to another facility.</p>		<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>		<p>✓</p>	<p>Monitoring visits occur about every 6 weeks</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p>	<p>Increase monitoring visits to once every month</p>
<p>all of the functions of the hatchery yearly monitoring visits being completed as described below?</p> <p>Annually examine each broodstock for the presence of reportable viral pathogens.</p> <p>Annually screen each salmon broodstock for the presence of <i>Renibacterium salmoninarum</i>.</p> <p>Conduct inspection by or under the supervision of qualified fish health specialist.</p>		<p>✓</p> <p>✓</p> <p>✓</p>			<p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p>	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Are hatchery sanitation procedures accepted?</p> <p>Are there any sources of pathogen-free water, especially for incubation and early rearing?</p> <p>Are the hatchery sanitation procedures understood and being followed as described below?</p> <p>Disinfect/water harden eggs in iodophor?</p> <p>Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?</p> <p>Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?</p> <p>Is equipment used to collect dead fish sanitized prior to its use in another pond and/or lot of fish?</p> <p>Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?</p> <p>Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?</p> <p>Are dead fish properly disposed of?</p>				<p>✓</p> <p></p> <p></p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>Discussion</p> <p>Inspection of facilities/ Discussion</p> <p>Inspection of facilities/ Discussion</p> <p>Inspection of facilities/ Discussion</p> <p>Inspection of facilities/ Discussion</p> <p>Inspection of facilities/ Discussion</p> <p>Inspection of facilities/ Discussion</p> <p>Inspection of facilities/ Discussion</p>	<p>Develop source of pathogen-free water</p>

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
Are the following water quality parameters within criteria? (PM #5a-5h)						
Water temperature		✓		✓	Review of records/Discussion	Develop groundwater supply for satellites
Dissolved gases					Review of records/Discussion	
Chemistry			✓		Review of records/Discussion	Run analysis for chemistry parameters
Turbidity				✓	Review of records/Discussion	Reduce turbidity at satellites
Alkalinity and hardness				✓	Review of records/Discussion	Increase alkalinity and hardness
Nitrite			✓		Review of records/Discussion	
Contaminants			✓		Review of records/Discussion	Run analysis for contaminants
io to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)		✓			Review of records/Discussion	
Are the rearing practices following the IHOT criteria? (PM #19)		✓			Review of records/Discussion	
io to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Is the hatchery's program outlined in a subbasin management plan?</p> <p>Go to subbasin plan PM #1</p>		✓			Columbia Basin System Planning Production Plan, LSRCP, and Idaho 5 year Anadromous Plan	
<p>Is the hatchery operating under a current hatchery operational plan?</p> <p>Go to operational plan PM #2</p>		✓			IHOT Operations Plan and Clearwater Operations Manual	
<p>Is hatchery monitoring and evaluation plan in place?</p> <p>Go to hatchery monitoring and evaluation plan PM #3</p>		✓			Anadromous Fish Hatchery Evaluation Plan	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Does the hatchery program meet requirements established in the regional hatchery policies and basin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, spawning and egg-take protocols?						
Does the hatchery program meet the requirements for the following?						
Species protocols (PM #4a)		✓			Review of records/Discussion	
Stock protocols (PM #4a)		✓			Review of records/Discussion	
Broodstock collection location protocols (PM #41)		✓			Review of records/Discussion	
Broodstock numbers protocols (PM #42)		✓			Review of records/Discussion	
Broodstock collection strategy protocols (PM #41)		✓			Review of records/Discussion	
Spawning protocols (PM #42)				✓	Review of records/Discussion	See PM #42
Egg-take protocols (PM #42)				✓	Protocols not followed due to low numbers of fish, did not meet sex ratio requirement	See PM #42

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Do the hatchery's performance meet requirements defined in the regional hatchery policies and in the basin and hatchery plans for the following areas: percent smoltification, rearing density, disease condition, and the number, size date(s), and location of release?</p> <p>Percent smoltification (PM #22a1)</p> <p>Rearing density (PM #22a2)</p> <p>Disease condition (PM #22a3)</p> <p>Number at release (PM #22a4)</p> <p>Size at release (PM #22a5)</p> <p>Date of release (PM #22a6)</p> <p>Location of release (PM #22a7)</p>				<p>✓</p> <p></p> <p></p> <p></p> <p>✓</p> <p></p> <p></p>	<p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p>	<p>Develop goal and monitoring program</p> <p></p> <p></p> <p>Improve adult returns</p> <p></p> <p></p> <p></p>
<p>Are fish reared in the subbasin or acclimated in the basin?</p> <p>PM #22b</p>		✓			Discussion	
<p>Is the release strategy appropriate for the program?</p> <p>PM #22c</p>		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
new programs, has a broodstock collection plan developed?						
Is the broodstock collection plan written?	✓				Existing Program; does not apply	
For a non-captive broodstock program:	✓				Existing Program; does not apply	
Was an unbiased, representative sample collected?						
Was the recommended number of broodstock collected?	✓				Existing Program; does not apply	
For a captive broodstock program:						
Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✓				Existing Program; does not apply	
Were full-sib crosses avoided?	✓				Existing Program; does not apply	
Is the broodstock collection plan understood and being followed by staff?	✓				Existing Program; does not apply	
a new program, was the donor selection outline followed in selecting the hatchery broodstock?						
Is a donor selection plan written?	✓				Existing Program; does not apply	
Was the donor selection outline followed in selecting the broodstock?	✓				Existing Program; does not apply	
Was the target stock recommended in the donor selection process actually used?	✓				Existing Program; does not apply	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
Is the broodstock collection plan written?		✓			Review broodstock collection plan	
Does the broodstock collection plan follow the guideline:						
Was an unbiased, representative sample collected?		✓			Discussion	
Was the recommended number of broodstock collected?		✓			Discussion	
Were the broodstock collection procedures in hatchery operation plan understood and followed?		✓			Discussion	
Were the broodstock collection procedures in hatchery operation plan understood and followed?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Is the appropriate number of spawners, male/female ratio, and fertilization protocols used?</p> <p>Are the spawning protocols written?</p> <p>Are daily or weekly spawning logs available?</p> <p>Was the appropriate number of spawners used?</p> <p>Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?</p> <p>Was the sex-ratio within the limits given in the performance standards?</p> <p>Were the fertilization protocols followed?</p> <p>If the hatchery needed to reduce the number of eggs retained, was this done by representative sampling of each male/female cross?</p>		<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p></p> <p>✓</p> <p></p>			<p>Review of plan</p> <p>Review of records</p> <p>Discussion</p> <p>Discussion</p> <p>Not enough fish</p> <p>Discussion</p> <p>Discussion</p>	<p>Improve adult returns</p>

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Where is a genetics monitoring and evaluation program in place?		✓			Review of draft plan	Finalize genetics monitoring and evaluation plan
Does the plan address the following elements listed in HOT:						
Does the program have elements needed to meet evaluation goals 1-4?		✓			Discussion	
Has a qualified geneticist reviewed and endorsed the program (goal 5)?				✓	Discussion	Have qualified geneticist review the plan
Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?		✓			Discussion	
Is the program understood and followed by staff?		✓			Discussion	

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

Remedial Actions at Clearwater Hatchery - Spring Chinook

This section presents the corrective actions required to bring the Clearwater Hatchery - Spring Chinook program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates ($\pm 40\%$).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 3. Remedial Actions Required at Clearwater Hatchery - Spring Chinook

Remedial Action Required	Cost	PMs¹
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery Improve adult returns	----	4c, 4g 4h, 17, 22a4, 42
Type 2 - Remedial actions requiring changes in agency policies or procedures Determine if adult contribution data is available Install alarms in quarantine area and security alarms Install telephone pagers Develop smoltification goals and monitoring program Follow IHOT disinfection protocols for transport vehicle cab Finalize genetics monitoring and evaluation plan Have qualified geneticist review the plan	---- ---- ---- ---- ---- ---- ----	4a 6 6 22a1 23 43 43
Type 3 - Remedial actions requiring changes in monitoring coverage or interval Run analysis for water chemistry parameters Run analysis for nitrite Run analysis for contaminants Follow IHOT standards for checking "other" alarms Follow IHOT QA/QC feed tests Increase "monthly" fish health monitoring visits to once a month	---- ---- ---- ---- ---- ----	5c 5f 5g 6 12 21, 26

¹ PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Type 4 - Remedial actions requiring significant capital expenditures		
Set up and program alarm system	\$20,000	6
Build 10 more incubator stacks	\$12,000	8
Double screen chinook raceways	\$3,500	10
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Improve green-egg to eyed-egg survival	----	4d
Improve eyed-egg to fry survival	----	4e
Increase alkalinity and hardness	----	5e
Develop groundwater supply for satellites	----	5a
Reduce turbidity at satellites	----	5d
Reduce weather related stress on fish at acclimation sites	----	13
Develop disease-free water supply	----	5h,28
Reduce weather related stress on fish at acclimation sites	----	13

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Clearwater Hatchery - Spring Chinook contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

**Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Clearwater Hatchery - Spring Chinook**

Year	Fisheries ¹ (Broodyear)	Spawning Grounds ¹ (Broodyear)	Hatchery ¹ (Broodyear)	Total Combined Contribution ² (Broodyear)	Smolt to Adult Survival (percent)
1981					
1982					
1983					
1984					
1985					
1986					
1987					
1988					
1989					
1990					
1991					
1992	first year of operation	first year of operation	first year of operation	first year of operation	first year of operation

¹ Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

² Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Clearwater Hatchery - Spring Chinook program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in a separate table (Table 5a).

Table 5. Annual Operating Expenses: Clearwater Hatchery - Spring Chinook

Hatchery	1994	1995	1996
1. Spring Chinook	\$743,260	\$363,720	\$20,046
2.			
3.			
4.			
5.			
Total Program Costs	\$743,260	\$363,720	\$20,046

The total expenditures for the Clearwater Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery is presented in separate tables (Tables 6a and 6b).

Table 6. Annual Operating Expenses - Clearwater Hatchery

Program	1993	1994	1995
1. Spring Chinook	\$743,260	\$363,720	\$20,046
2. Summer Steelhead	\$361,138	\$794,624	\$626,629
3. Rainbow Trout	?	?	?
4.			
5.			
Total Hatchery Costs	\$1,104,399	\$1,158,345	\$646,674

Table 5a. Annual Operating Expenses: Clearwater Hatchery - Spring Chinook**Expenditure Occurring at Clearwater Hatchery**

Component	1994	1995	1996
Personnel Costs	\$495,802	\$507,505	\$349,651
Operational Costs	\$421,669	\$446,216	\$167,984
Capital Costs	\$417,950	\$40,298	\$32,759
Indirect Costs	\$168,978	\$164,326	\$96,280
Lumped Hatchery Costs ¹	0	0	0
Lumped Third-Party Costs			
Total Hatchery Costs	\$1,104,399	\$1,158,345	\$646,674
Source of Funds			
Program Production (#)	1,298,774	361,622	25,413
Total Production (#)	1,929,874	1,152,949	828,413
Program as Percent of Total	67.3	31.4	3.1
Program Costs	\$743,260	\$363,720	\$20,046

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6a. Detailed Expenditures at Clearwater Hatchery by Program**Spring Chinook**

Component	1994	1995	1996
Personnel Costs	\$495,802	\$507,505	\$349,651
Operational Costs	\$421,669	\$446,216	\$167,984
Capital Costs	\$417,950	\$40,298	\$32,759
Indirect Costs	\$168,978	\$164,326	\$96,280
Lumped Hatchery Costs ¹	0	0	0
Lumped Third-Party Costs			
Total Hatchery Costs	\$1,104,399	\$1,158,345	\$646,674
Source of Funds			
Program Production (#)	1,298,774	361,622	25,413
Total Production (#)	1,929,874	1,152,949	828,413
Program as Percent of Total	67.3	31.4	3.1
Program Costs	\$743,260	\$363,720	\$20,046

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6b. Detailed Expenditures at Clearwater Hatchery by Program

Summer Steelhead

Component	1994	1995	1996
Personnel Costs	\$495,802	\$507,505	\$349,651
Operational Costs	\$421,669	\$446,216	\$167,984
Capital Costs	\$417,950	\$40,298	\$32,759
Indirect Costs	\$168,978	\$164,326	\$96,280
Lumped Hatchery Costs ¹	0	0	0
Lumped Third-Party Costs			
Total Hatchery Costs	\$1,104,399	\$1,158,345	\$646,674
Source of Funds			
Program Production (lb)	631,100	791,327	803,000
Total Production (lb)	1,929,874	1,152,949	828,413
Program as Percent of Total	32.7%	68.6	96.9
Program Costs	\$361,138	\$794,624	\$626,629

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.